What is claimed is:

1. A method for calculating the compressibility factors of a mixture using the cubic equation of state (CEOS), said mixture having a liquid region, said method comprising:

a) calculating a pure liquid compressibility factor when said compressibility factor is in said liquid region;

b) using the second virial coefficient of said CEOS to determine from said pure liquid compressibility factor a vapor compressibility factor extensible in said liquid region; and

c) accepting the higher of said pure liquid compressibility factor or said vapor compressibility factor extensible in said liquid region.

2. The method of claim 1 further comprising determining that said compressibility factor is in said liquid region.

3. The method of claim 1 wherein said mixture has a vapor region and said method further comprises determining that said compressibility factor is in said vapor region and accepting a pure vapor compressibility factor when said compressibility factor is in said vapor region.

4. A method for calculating the compressibility factors of a mixture using the cubic equation of state (CEOS), said mixture having a vapor-liquid equilibrium region, said method comprising:

a) determining that said compressibility factor is in said vapor-liquid equilibrium region;

b) calculating when said compressibility factor is in said vapor-liquid equilibrium region a pure liquid compressibility factor;

c) using the virial coefficients of said CEOS and said pure liquid compressibility factor calculated when said compressibility factor is in said vapor-liquid

equilibrium region to determine a vapor compressibility factor in said vapor-liquid equilibrium region; and

d) accepting the higher of said pure liquid compressibility factor calculated when said compressibility factor is in said vapor-liquid equilibrium region or said vapor compressibility factor calculated in said vapor-liquid equilibrium region.

5. A method for calculating the compressibility factors of a mixture using the cubic equation of state (CEOS), said mixture having a vapor-liquid equilibrium region, said method comprising:

a) calculating a pure liquid compressibility factor for said vapor-liquid equilibrium region;

b) using the virial coefficients of said CEOS and said pure liquid compressibility factor calculated for said vapor-liquid equilibrium region to determine a vapor compressibility factor in said vapor-liquid equilibrium region; and

c) accepting the higher of said pure liquid compressibility factor calculated for said vapor-liquid equilibrium region or said vapor compressibility factor calculated in said vapor-liquid equilibrium region.

6. A method for calculating the compressibility factors of a mixture using the cubic equation of state (CEOS), said mixture having a liquid region and a vapor-liquid equilibrium region, said method comprising:

determining that said compressibility factor is either in said liquid region or in said vapor-liquid equilibrium region;

said method when said compressibility factor is in said liquid region comprising:

calculating a pure liquid compressibility factor;

using the second virial coefficient of said CEOS to determine from said pure liquid compressibility factor a vapor compressibility factor extensible in said liquid region; and

accepting the higher of said pure liquid compressibility factor or said vapor compressibility factor extensible in said liquid region;

said method when said compressibility factor is in said liquid region comprising:

calculating a pure liquid compressibility factor;

using the virial coefficients of said CEOS and said pure liquid compressibility factor to determine a vapor compressibility factor in said vapor-liquid equilibrium region; and

accepting the higher of said pure liquid compressibility factor or said vapor compressibility factor calculated in said vapor-liquid equilibrium region.

7. A method for calculating the compressibility factors of a mixture using the cubic equation of state (CEOS), said mixture having a liquid region and a vapor-liquid equilibrium region, said method comprising:

a) calculating a pure liquid compressibility factor when said compressibility factor is in said liquid region;

b) using the second virial coefficient of said CEOS to determine from said pure liquid compressibility factor a vapor compressibility factor extensible in said liquid region; and

c) accepting the higher of said pure liquid compressibility factor or said vapor compressibility factor extensible in said liquid region;

d) calculating a pure liquid compressibility factor for said vapor-liquid equilibrium region;

e) using the virial coefficients of said CEOS and said pure liquid compressibility factor calculated for said vapor-liquid equilibrium region to determine a vapor compressibility factor in said vapor-liquid equilibrium region; and

f) accepting the higher of said pure liquid

compressibility factor calculated for said vapor-liquid equilibrium region or said vapor compressibility factor calculated in said vapor-liquid equilibrium region.

8. A method for calculating the liquid compressibility factor of a mixture using the cubic equation of state (CEOS), said mixture having a liquid region, said method comprising:

a) calculating a pure liquid compressibility factor when said compressibility factor is in said liquid region;

b) determining that the rate of change of said pure liquid compressibility factor with temperature is or is not less than zero; and

c) accepting said pure liquid compressibility as said liquid compressibility factor when said pure liquid compressibility factor rate of change is not less than zero.

9. The method of claim 8 further comprising:

calculating said liquid compressibility factor as the ratio of the change with temperature of two of the virial coefficients of said CEOS when said pure liquid compressibility factor rate of change is less than zero.

10. The method of claim 8 further comprising:

determining that said compressibility factor is in said liquid region.

11. The method of claim 1 wherein said method is executed in a computing device in an industrial plant, said industrial plant comprising an industrial process, an automation system connected to said process, said computing device associated either with said process or said automation system.

12. The method of claim 5 wherein said method is executed in a computing device in an industrial plant, said industrial plant comprising an industrial process, an automation system connected to said process, said

computing device associated either with said process or said automation system.

13. The method of claim 8 wherein said method is executed in a computing device in an industrial plant, said industrial plant comprising an industrial process, an automation system connected to said process, said computing device associated either with said process or said automation system.

14. A computer readable medium having instructions for causing a computer to execute a method for calculating the compressibility factors of a mixture using the cubic equation of state (CEOS), said mixture having a liquid region, said instructions comprising:

a) calculating a pure liquid compressibility factor when said compressibility factor is in said liquid region;

b) using the second virial coefficient of said CEOS to determine from said pure liquid compressibility factor a vapor compressibility factor extensible in said liquid region; and

c) accepting the higher of said pure liquid compressibility factor or said vapor compressibility factor extensible in said liquid region.

15. A computer readable medium having instructions for causing a computer to execute a method for calculating the compressibility factors of a mixture using the cubic equation of state (CEOS), said mixture having a vapor-liquid equilibrium region, said instructions comprising:

a) calculating a pure liquid compressibility factor for said vapor-liquid equilibrium region;

b) using the virial coefficients of said CEOS and said pure liquid compressibility factor calculated for said vapor-liquid equilibrium region to determine a vapor compressibility factor in said vapor-liquid equilibrium region; and

c) accepting the higher of said pure liquid compressibility factor calculated for said vapor-liquid equilibrium region or said vapor compressibility factor calculated in said vapor-liquid equilibrium region.

16. A computer readable medium having instructions for causing a computer to execute a method for calculating the compressibility factors of a mixture using the cubic equation of state (CEOS), said mixture having a liquid region, said instructions comprising:

a) calculating a pure liquid compressibility factor when said compressibility factor is in said liquid region;

b)determining that the rate of change of said pure liquid compressibility factor with temperature is or is not less than zero; and

c)accepting said pure liquid compressibility as said liquid compressibility factor when said pure liquid compressibility factor rate of change is not less than zero.